WYSSLING CONSULTING
CORPORATE EXPERIENCE WITH SMALL BUSINESS VALUE

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November 2, 2022

Scott Wyssling, PE

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Reason: I am the author of this document
Location: your signing location here
Date: 2022.11.02 15:00:01-06'00'
Foxit PDF Editor Version: 11.1.0

LGCY Solar
3333 Digital Drive #600
Lehi, UT 84043

Re: Engineering Services
Raynor Residence
107 Paul Clayton Circle COATS, NC
8.360 kW System

To Whom it May Concern,

Pursuant to your request, we have reviewed the following information regarding ground mount solar panel installation at the above referenced location:

1. Product documentation prepared by IronRidge Corp detailing the IronRidge ground mount system being utilized for the proposed ground mount system.
2. Design drawings of the proposed system including a site plan, and details for the solar panels. This information was prepared by Legacy Solar and will be utilized for approval and construction of the proposed system.

Based on our review of the Photovoltaic Array installed at 4 modules high and 5 modules wide. The PV array shall have a pier spacing of 9' max North/South and 6'East/West. Based on a wind speed of 110 mph, Exposure C and a ground snow load of 20 PSF, it was determined that the minimum required footing depth is 4' below grade with a 16" diameter pier footing with 2" Dia schedule 40 post. The footing size based upon the worst case loading due to horizontal and vertical wind loading.

Based on the above evaluation, it is the opinion of this office that with appropriate construction the footing and post assembly will adequately support the proposed solar array. This evaluation is in conformance with the 2018 IBC, current industry and standards, and based on information supplied to us at the time of this report.

This certification is specific to the footing design for the solar system and does not include the racking system. Racking system and components designed and specified by the manufacturer (IronRidge).

Should you have any questions regarding the above or if you require further information do not hesitate to contact me.

Very truly yours,

Scott E. Wyssling, PE
North Carolina License No. 46546

NORTH CAROLINA PROFESSIONAL SEAL 046546 ENGINEER SCOTT E. WYSSLING

Wyssling Consulting, PLLC
76 N Meadowbrook Drive Alpine UT 84004
North Carolina COA # P-2308
11/2/2022

THIS PLAN HAS BEEN ELECTRONICALLY SIGNED AND SEALED BY SCOTT WYSSLING, PE USING A DIGITAL SIGNATURE AND DATE. PRINTED COPIES OF THIS DOCUMENT ARE NOT CONSIDERED SIGNED AND SEALED AND THE SIGNATURE MUST BE VERIFIED ON ANY ELECTRONIC COPIES.

SCOPE OF WORK:
TO INSTALL A GROUND MOUNTED SOLAR PHOTOVOLTAIC SYSTEM AT THE OWNER RESIDENCE LOCATED AT 107 PAUL CLAYTON CIR COATS, NC 27521.
THE POWER GENERATED BY THE PV SYSTEM WILL BE INTERCONNECTED WITH THE UTILITY GRID THROUGH THE EXISTING ELECTRICAL SERVICE EQUIPMENT.
THE PV SYSTEM DOES NOT INCLUDE STORAGE BATTERIES

EQUIPMENT SUMMARY
19 APTOS SOLAR DNA-120-MF10-440 MODULES
19 ENPHASE IQ8PLUS-72-2-US MICROINVERTERS

GOVERNING CODES
2017 NATIONAL ELECTRICAL CODE 2018 INTERNATIONAL FIRE CODE 2018 INTERNATIONAL BUILDING CODE 2018 INTERNATIONAL RESIDENTIAL CODE 2018 NORTH CAROLINA STATE BUILDING CODE
AUTHORITY HAVING JURISDICTION (AHJ): HARNETT COUNTY

SYSTEM RATING
8.36 KWDC
5.51 KWAC

GENERAL NOTES:
- THESE CONSTRUCTION DOCUMENTS HAVE BEEN BASED ON FIELD INSPECTIONS AND OTHER INFORMATION AVAILABLE AT THE TIME. ACTUAL FIELD CONDITIONS MAY REQUIRE MODIFICATIONS IN CONSTRUCTION DETAILS.
- ARCHITECT HAS NOT BEEN RETAINED TO SUPERVISE ANY CONSTRUCTION OR INSTALLATION OF ANY EQUIPMENT AT SITE.
- CONTRACTOR SHALL FURNISH ALL LABOR, MATERIAL, EQUIPMENT, TOOLS, OBTAINS ALL PERMITS, LICENSES AND PAY ALL REQUIRED FEES AND COMPLETE INSTALLATION.
- CONTRACTOR HAS THE FULL RESPONSIBILITY TO CHECK AND VERIFY ALL DIMENSIONS AND EXISTING CONDITIONS. ANY DISCREPANCIES SHALL BE REPORTED TO THE ENGINEER BEFORE PROCEEDING WITH THE WORK. ANY WORK STARTED BEFORE CONSULTATION AND ACCEPTANCE BY THE ENGINEER SHALL BE THE SOLE RESPONSIBILITY OF THE CONTRACTOR AND SHALL BE SUBJECT TO CORRECTION BY THEM WITHOUT ADDITIONAL COMPENSATION.
- DAMAGE CAUSED TO THE EXISTING STRUCTURE, PIPES, DUCTS, WINDOWS, WALL, FLOORS, ETC. SHALL BE REPAIRED TO THE ORIGINAL CONDITION OR REPLACED BY THE CONTRACTOR AT NO ADDITIONAL COST.
- THE CONTRACTOR SHALL BE HELD RESPONSIBLE FOR THE PROPER INSTALLATION AND COMPLETION OF THE WORK WITH APPROVED MATERIALS.
- NO CHANGES ARE TO BE MADE WITHOUT THE CONSULTATION AND APPROVAL OF THE ARCHITECT.
- CONTRACTOR SHALL OBTAIN BUILDING PERMIT. NO WORK TO START UNLESS BUILDING PERMIT IS PROPERLY DISPLAYED.
- ALL WORKMANSHIP AND MATERIALS SHALL BE OF FIRST QUALITY AND IN COMPLIANCE WITH THE REQUIREMENTS OF THE NC BUILDING CODE, THE DEPARTMENT OF ENVIRONMENTAL PROTECTION AND ALL PERTINENT AGENCIES.
- IT IS ESSENTIAL THAT ALL WORK PROCEED WITH THE MAXIMUM COOPERATION OF ALL PARTIES AND WITH MINIMUM INTERFERENCE TO THE OCCUPANTS WITHIN THE BUILDING. THE OWNER'S DIRECTIONS IN THIS REGARD SHALL BE FULLY COMPLIED WITH.
- ALL EXPOSED PLUMBING, HVAC, ELECTRICAL DUCTWORK, PIPING AND CONDUITS ARE TO BE PAINTED BY GENERAL CONTRACTOR.
- THE CONTRACTOR SHALL PERFORM THE WORK IN STRICT CONFORMANCE WITH THE LOCAL LAWS, REGULATIONS AND THE NATIONAL ELECTRIC CODE.
- THE CONTRACTOR SHALL OBTAIN ALL PERMITS, APPROVALS, AFFIDAVITS, CERTIFICATIONS, ETC. AND PAY ALL FEES AS REQUIRED BY THE LOCAL AUTHORITIES.
- CONTRACTORS SHALL OBTAIN FIRE CERTIFY UPON COMPLETION OF WORK.

WIRING AND CONDUIT NOTES:
- ALL CONDUIT SIZES AND TYPES, SHALL BE LISTED FOR ITS PURPOSE AND APPROVED FOR THE SITE APPLICATIONS
- ALL PV CABLES AND HOMERUN WIRES BE #10AWG *USE-2, PV WIRE, OR PROPRIETARY SOLAR CABLING SPECIFIED BY MFR, OR EQUIVALENT; ROUTED TO SOURCE CIRCUIT COMBINER BOXES AS REQUIRED
- ALL CONDUCTORS AND OCPD SIZES AND TYPES SPECIFIED ACCORDING TO [NEC 690.8 (A)(1) & (B)(1)], [NEC 240] [NEC 690.7] FOR MULTIPLE CONDUCTORS
- ALL PV DC CONDUCTORS IN CONDUIT EXPOSED TO SUNLIGHT SHALL BE DERATED ACCORDING TO [NEC TABLE 310.15 (B)(2)(C)] BLACK ONLY**
- EXPOSED ROOF PV DC CONDUCTORS SHALL BE USE-2, 90°C RATED, WET AND UV RESISTANT, AND UL LISTED RATED FOR 600V, UV RATED SPIRAL WRAP SHALL BE USED TO PROTECT WIRE FROM SHARP EDGES
- PHASE AND NEUTRAL CONDUCTORS SHALL BE DUAL RATED THHN/THWN-2 INSULATED, 90°C RATED, WET AND UV RESISTANT, RATED FOR 600V PER NEC 2008 OR 1000V PER NEC 2011
- 4-WIRE DELTA CONNECTED SYSTEMS HAVE THE PHASE WITH THE HIGHER VOLTAGE TO GROUND MARKED ORANGE OR IDENTIFIED BY OTHER EFFECTIVE MEANS
- ALL SOURCE CIRCUITS SHALL HAVE INDIVIDUAL SOURCE CIRCUIT PROTECTION
- VOLTAGE DROP LIMITED TO 2% FOR DC CIRCUITS AND 1% FOR AC CIRCUITS
- AC CONDUCTORS >4AWG COLOR CODED OR MARKED: PHASE A OR L1- BLACK, PHASE B OR L2- RED, PHASE C OR L3- BLUE, NEUTRAL- WHITE/GRAY

Scott Wyssling, PE

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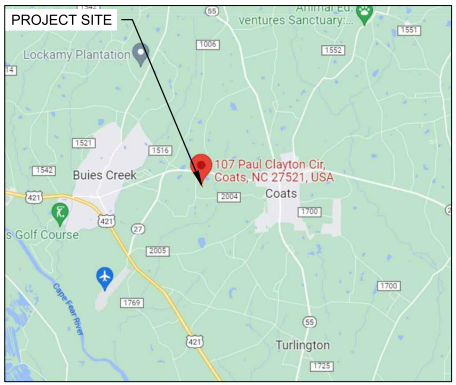
ELECTRICAL NOTES:
- THE EQUIPMENT AND ALL ASSOCIATED WIRING AND INTERCONNECTION SHALL BE INSTALLED ONLY BY QUALIFIED PEOPLE. A QUALIFIED PERSON IS ONE WHO HAS SKILLS AND KNOWLEDGE RELATED TO THE CONSTRUCTION AND OPERATION OF THE ELECTRICAL EQUIPMENT AND INSTALLATIONS AND HAS RECEIVED SAFETY TRAINING TO RECOGNIZE AND AVOID THE HAZARDS INVOLVED. (NEC 690.4(E) AND 705.6)
- LOCAL UTILITY PROVIDER SHALL BE NOTIFIED PRIOR TO USE AND ACTIVATION OF ANY SOLAR PHOTOVOLTAIC INSTALLATION. FOR A LINE SIDE TAP CONNECTION, UTILITY NEEDS TO BE NOTIFIED WELL IN ADVANCE TO COORDINATE BUILDING ELECTRICAL SHUT OFF.
- NEW CONDUIT ROUTING SHOWN IS ESSENTIALLY SCHEMATIC. SUBCONTRACTOR SHALL LAY OUT RUNS TO SUIT FIELD CONDITIONS AND THE COORDINATION REQUIREMENTS OF OTHER TRADES.
- ARRAY WIRING SHOULD NOT BE READILY ACCESSIBLE EXCEPT TO QUALIFIED PERSONNEL.
- ALL EXTERIOR CONDUIT, FITTINGS, AND BOXES SHALL BE WATERTIGHT AND APPROVED FOR USE IN WET LOCATIONS. (NEC 314.15A).
- WIRING METHODS FOR PV SYSTEM CONDUCTORS AREN'T PERMITTED WITHIN 10 IN. OF THE ROOF DECKING OR SHEATHING EXCEPT WHERE LOCATED DIRECTLY BELOW THE ROOF SURFACE THAT'S COVERED BY PV MODULES AND ASSOCIATED EQUIPMENT WIRING
- BACK-FED BREAKER MUST BE AT THE OPPOSITE END OF BUS BAR FROM THE MAIN BREAKER OR MAIN LUG SUPPLYING CURRENT FROM THE UTILITIES.
- ALL CONDUCTORS AND WIRE TIES EXPOSED TO SUNLIGHT ARE LISTED AS UV RESISTANT.
- CONTRACTOR SHALL FOLLOW ALL ELECTRICAL EQUIPMENT LABELING REQUIREMENTS IN NEC 690 AND IFC 2018
- MEASURE THE LINE-TO-LINE AND LINE-TO-NEUTRAL VOLTAGE OF ALL SERVICE ENTRANCE CONDUCTORS PRIOR TO INSTALLING ANY SOLAR EQUIPMENT. THE VOLTAGES FOR THE 240VAC RATED.

SHEET INDEX

1 PV-0 HOUSE PHOTO SCALE: NTS



2 PV-0 VICINITY MAP SCALE: NTS

LGCY POWER
LGCY POWER
3333 DIGITAL DR#600, LEHI, UT 84043, UNITED STATES
PHONE: 855-353-4899
ELECTRICAL LIC: U.21498

REVISIONS

	DATE	BY
	11/2/22	A

SEAL 046546
Signature with Seal
SCOTT E. WYSSLING ENGINEER

Wyssling Consulting, PLLC
376 N Meadowbrook Drive Alpine UT 84004
North Carolina COA # P-2308

11/2/2022

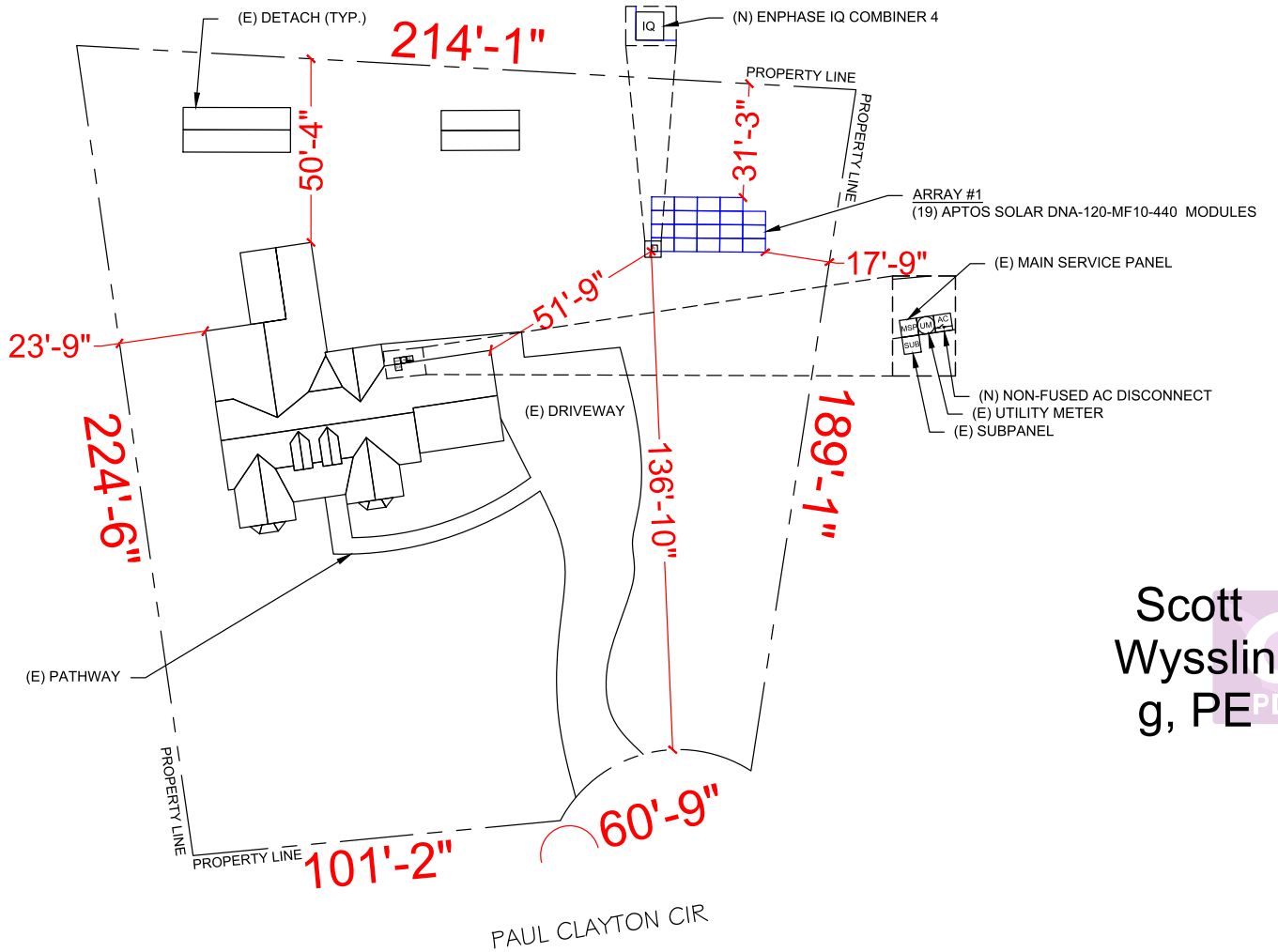
RICKY RAYNOR RESIDENCE
107 PAUL CLAYTON CIR
COATS, NC 27521
PH NO. (919) 625-7661
EMAIL ID: mraynor@harnett.k12.nc.us

DATE: 11/02/2022

SHEET NAME
COVER PAGE

SHEET SIZE
ANSI B
11" X 17"

SHEET NUMBER
PV-0



1 PLOT PLAN WITH ROOF PLAN

PV-1 SCALE: 1/32" = 1'-0"

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ELECTRICAL LIC: U.21498

REVISIONS

NO.	DESCRIPTION	DATE	REV
1		11/2/2022	A

NORTH CAROLINA PROFESSIONAL ENGINEER SEAL 046546 SCOTT E. WYSSLING

Signature with Seal

Wyssling Consulting, PLLC
76 N Meadowbrook Drive Alpine UT 84004
North Carolina COA # P-2308

11/2/2022

PRINCIPAL'S NAME & ADDRESS

RICKY RAYNOR RESIDENCE
107 PAUL CLAYTON CIR
COATS, NC 27521
PH NO. (919) 625-7661
EMAIL ID: mraynor@harnett.k12.nc.us

DATE: 11/02/2022

SHEET NAME
SITE PLAN

SHEET SIZE
ANSI B
11" X 17"

SHEET NUMBER
PV-1

INVERTER SPECIFICATIONS	
MANUFACTURER / MODEL	ENPHASE IQ8PLUS-72-2-US
MAX DC SHORT CIRCUIT CURRENT	15 A
CONTINUOUS OUTPUT CURRENT	1.21A (240V)

DESIGN SPECIFICATION	
RISK CATEGORY:	II
CONSTRUCTION:	SFD
ZONING:	RESIDENTIAL
SNOW LOAD (ASCE 7-16):	20 PSF
EXPOSURE CATEGORY:	C
WIND SPEED (ASCE 7-16):	110 MPH

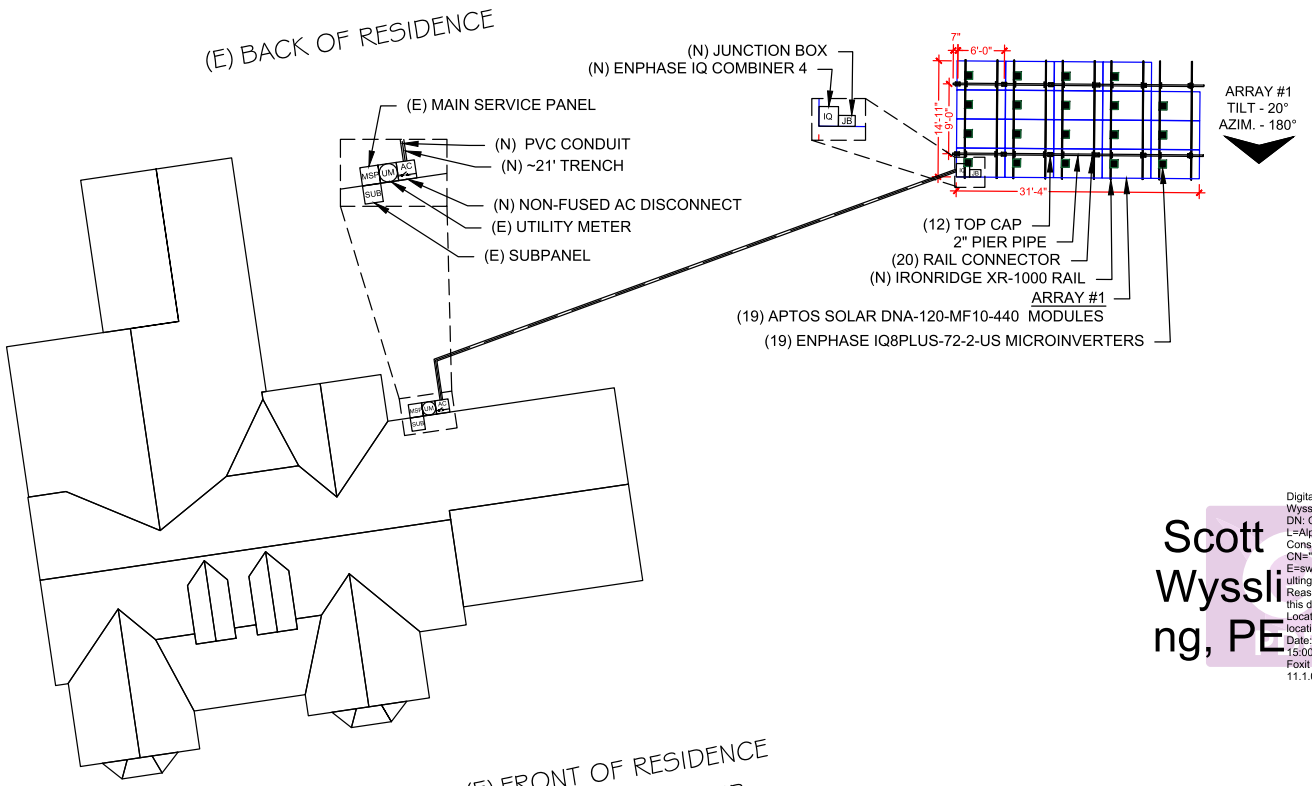
LEGEND

- JB — (N) JUNCTION BOX
- UM — (E) UTILITY METER
- MSP — (E) MAIN SERVICE PANEL (MSP)
- SUB — (E) SUBPANEL (SUB)
- AC — (N) NON-FUSED AC DISCONNECT
- IQ — (N) ENPHASE IQ COMBINER 4
- - VENT, ATTIC FAN (ROOF OBSTRUCTION)
- - ROOF ATTACHMENT
- - CONDUIT
- - TOP CAP
- - PIPE
- - TRENCH

MODULE TYPE, DIMENSIONS & WEIGHT	
NUMBER OF MODULES:	19 MODULES
MODULE TYPE:	APTOS SOLAR DNA-120-MF10-440
MODULE WEIGHT:	52.9 LBS
MODULE DIMENSIONS:	74.92" X 44.65" =23.23 SF
UNIT WEIGHT OF AREA:	2.28 PSF

ARRAY DESCRIPTION		
ARRAY	ARRAY TILT	AZIMUTH
#1	20°	180°

ARRAY AREA CALC'S		
ARRAY	# OF MODULES	ARRAY AREA (Sq. Ft.)
#1	19	441.37



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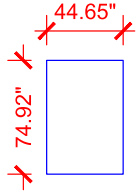

APTOS SOLAR
DNA-120-MF10-440
MODULES

1 ROOF PLAN & MODULES
PV-2 SCALE: 1/16" = 1'-0"

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LGCY POWER
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PHONE: 855-353-4899
ELECTRICAL LIC: U.21498

REVISIONS

DESCRIPTION	DATE	REV
[illegible]	[illegible]/22	A

NORTH CAROLINA PROFESSIONAL ENGINEER SEAL 046546 SCOTT E. WYSSLING

Signature with Seal

Wyssling Consulting, PLLC
76 N Meadowbrook Drive Alpine UT 84004
North Carolina COA # P-2308

11/2/2022

PROJECT NAME & ADDRESS

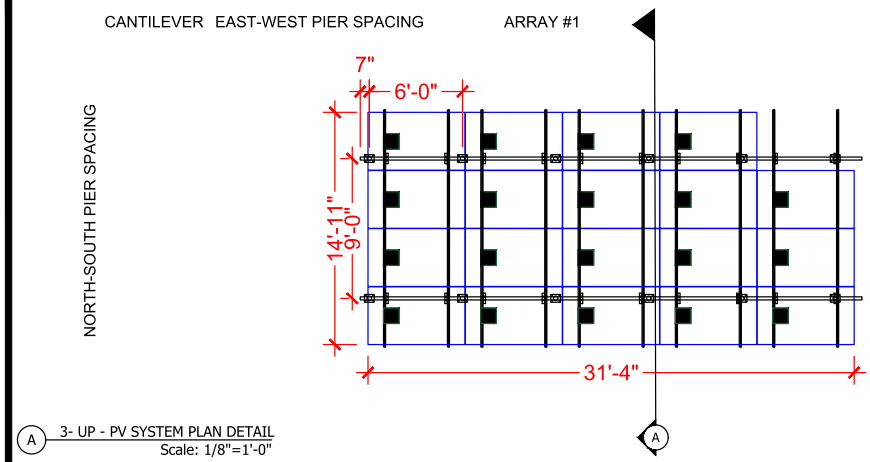
RICKY RAYNOR
RESIDENCE
107 PAUL CLAYTON CIR
COATS, NC 27521
PH NO. (919) 625-7661
EMAIL ID: mraynor@harnett.k12.nc.us

DATE: 11/02/2022

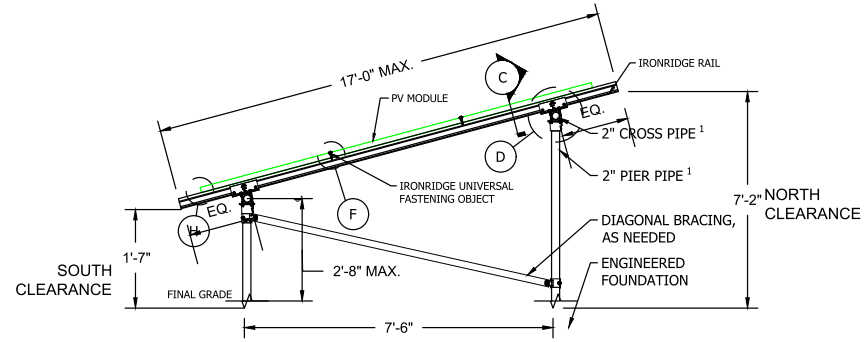
SHEET NAME
ROOF PLAN & MODULES

SHEET SIZE
ANSI B
11" X 17"

SHEET NUMBER
PV-2



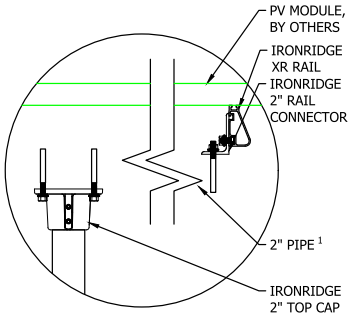
A 3- UP - PV SYSTEM PLAN DETAIL
Scale: 1/8"=1'-0"



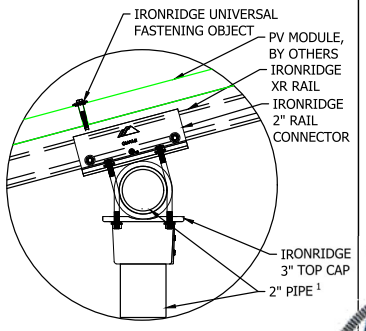
B 3-UP - PV SYSTEM SIDE SECTION
Scale: NTS

SHEET NOTES

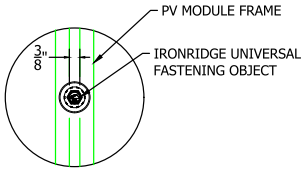
1. SCHEDULE 40 PIPE OR ALLIED MECHANICAL TUBING (12GA WALL THICKNESS)



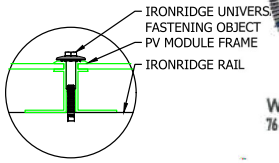
C PIPE FITTINGS DETAIL
NTS



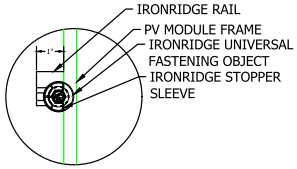
D PIPE FITTINGS DETAIL
NTS



E DETAIL, MID CLAMP PLAN
NTS



F DETAIL, MID CLAMP FRONT
NTS



G DETAIL, END CLAMP (UFO) PLAN
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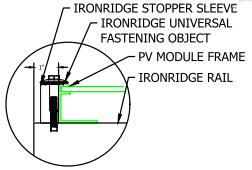

H DETAIL, END CLAMP (UFO) FRONT
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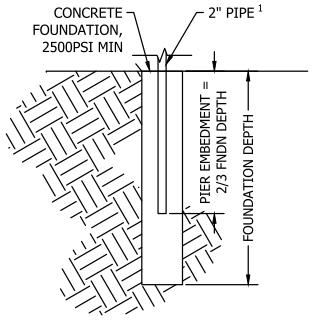
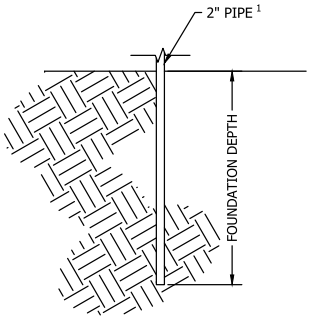


J DRILL/POUR FOUNDATION
Scale: NTS



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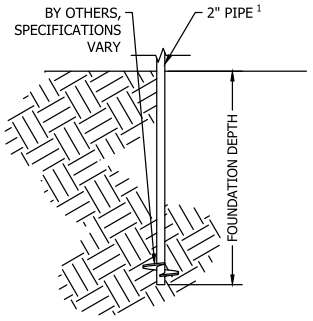

L HELICAL PILE FOUNDATION
Scale: NTS

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REVISIONS

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SEAL
046546
Signature with Seal
SCOTT E. WYSSLING
ENGINEER

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PH NO. (919) 625-7661
EMAIL ID: mraynor@harnett.k12.nc.us

DATE: 11/02/2022

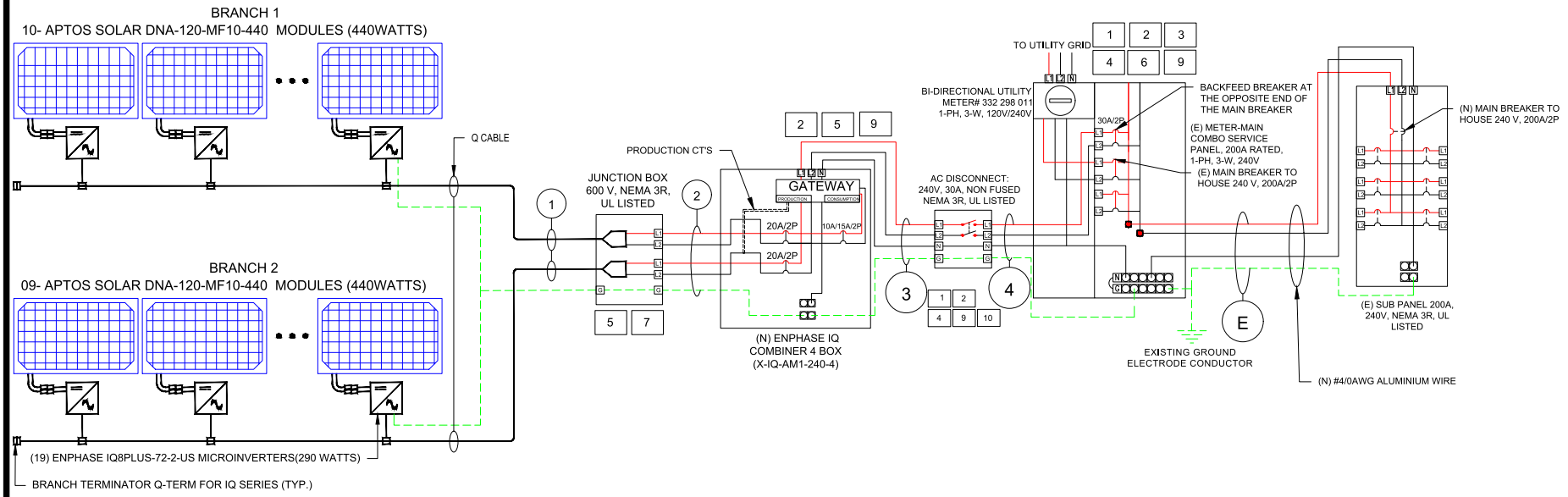
SHEET NAME
ATTACHMENT DETAILS

SHEET SIZE
ANSI B
11" X 17"

SHEET NUMBER
PV-3

ID	TYPICAL	INITIAL CONDUCTOR LOCATION	FINAL CONDUCTOR LOCATION	CONDUCTOR			CONDUIT	# OF PARALLEL CIRCUITS	CURRENT-CARRYING CONDUCTORS IN CONDUIT	CONDUIT FILL PERCENT	OCPD	EGC		TEMP. CORR. FACTOR		CONDUIT FILL FACTOR	CONT. CURRENT	MAX. CURRENT	BASE AMP.	DERATED AMP.	TERM. TEMP. RATING	LENGTH	VOLTAGE DROP
1	2	BRANCH	JUNCTION BOX	12 AWG	Q CABLE	-	-	1	2	N/A	N/A	6 AWG	BARE COPPER	0.71	(56°C)	N/A	12.1A	15.1A	N/A	N/A	75°C	55FT	0.46%
2	1	JUNCTION BOX	IQ COMBINER BOX	10 AWG	THWN-2	COPPER	MIN 0.75" Dia EMT	2	4	19.09%	20A	10 AWG	THWN-2, COPPER	0.96	(34°C)	0.8	12.1A	15.1A	40A	30.7A	75°C	5FT	0.07%
3	1	IQ COMBINER BOX	NON-FUSED AC DISCONNECT	6 AWG	THWN-2	COPPER	MIN 0.75" Dia PVC	1	3	36.77%	N/A	10 AWG	THWN-2, COPPER	0.96	(34°C)	1	23.0A	28.7A	75A	72.0A	75°C	85FT	0.80%
4	1	NON-FUSED AC DISCONNECT	MSP	6 AWG	THWN-2	COPPER	MIN 0.75" Dia EMT	1	3	36.77%	30A	10 AWG	THWN-2, COPPER	0.96	(34°C)	1	23.0A	28.7A	75A	72.0A	75°C	5FT	0.05%

NOTE:- WIRE BETWEEN JB WILL FLOW INSIDE THE ATTIC



INTERCONNECTION
120% RULE - NEC 705.12(B)(2)(3)(d)
UTILITY FEED + SOLAR BACKFEED
200 A + 30A = 230A
BUSS RATING x 120%
200 A x 120% =240A

SERVICE INFO	
UTILITY PROVIDER:	DUKE ENERGY PROGRESS
MAIN SERVICE VOLTAGE:	240V
MAIN CIRCUIT BREKAER RATING:	200A
MAIN SERVICE PANEL:	200A
MAIN SERVICE LOCATION:	NORTH
SERVICE FEED SOURCE:	UNDERGROUND

1 ELECTRICAL LINE DIAGRAM
PV-4 SCALE: NTS

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PHONE: 855-353-4899
ELECTRICAL LIC: U.21498

REVISIONS		
DESCRIPTION	DATE	REV
REVISION	09/29/2022	A
REVISION	11/02/2022	B

Signature with Seal

PROJECT NAME & ADDRESS

RICKY RAYNOR
RESIDENCE
107 PAUL CLAYTON CIR
COATS, NC 27521
PH NO. (919) 625-7661
EMAIL ID: mraynor@harnett.k12.nc.us

DATE: 11/02/2022

SHEET NAME
ELECTRICAL LINE & CALCS.

SHEET SIZE
ANSI B
11" X 17"

SHEET NUMBER
PV-4

LGCY POWER

LGCY POWER
3333 DIGITAL DR#600, LEHI,
UT 84043, UNITED STATES
PHONE: 855-353-4899

ELECTRICAL LIC: U.21498

REVISIONS		
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DATE: 11/02/2022

SHEET NAME
ELECTRICAL PHOTOS

SHEET SIZE
ANSI B
11" X 17"

SHEET NUMBER
PV-4A

SOLAR MODULE SPECIFICATIONS	
MANUFACTURER / MODEL	APTOS SOLAR DNA-120-MF10-440
VMP	33.82 V
IMP	13.01 A
VOC	40.8V
ISC	13.61A
TEMP. COEFF. VOC	-0.31%/°K
MODULE DIMENSION	74.92" (L) x 44.65" (W)
MODULE PTC RATING	406 W
PANEL WATTAGE	440W

INVERTER SPECIFICATIONS	
MANUFACTURER / MODEL	ENPHASE IQ8PLUS-72-2-US
MAX DC SHORT CIRCUIT CURRENT	15 A
CONTINUOUS OUTPUT CURRENT	1.21A (240V)

AMBIENT TEMPERATURE SPECS	
RECORD LOW TEMP	-12°C
AMBIENT TEMP (HIGH TEMP 2%)	34°C
CONDUIT HEIGHT	7/8"
ROOF TOP TEMP	90°C
CONDUCTOR TEMPERATURE RATE	56°C
MODULE TEMPERATURE COEFFICIENT OF VOC	-0.29%/°K

PERCENT OF VALUES	NUMBER OF CURRENT CARRYING CONDUCTORS IN EMT
0.80	4-6
0.70	7-9
0.50	10-20

Voltage rise in Q Cable from the Microinverters to the Junction Box

For branch circuit #1 of 10 IQ 8+Micros, the voltage rise on the 240 VAC Q Cable is 0.46%

For branch circuit #2 of 09 IQ 8+Micros, the voltage rise on the 240 VAC Q Cable is 0.38%

Voltage rise from the Junction Box to the IQ Combiner box

VRise = (amps/inverter × number of inverters) × (resistance in Ω/ft) × (2-way wire length in ft.)
= (1.21 amp × 10) × (0.00129 Ω/ft) × (5 ft × 2)
= 12.1 amps × 0.00129 Ω/ft × 10 ft
= 0.16 volts
%VRise = 0.16 volts ÷ 240 volts = 0.07%
The voltage rise from the Junction Box to the IQ Combiner Box is 0.07%

Voltage rise from the IQ Combiner box to AC Disconnect

VRise = (amps/inverter × number of inverters) × (resistance in Ω/ft.) × (2-way wire length in ft.)
= (1.21 amp × 19) × (0.000491 Ω/ft) × (85 ft. × 2)
= 23.0 amps × 0.000491 Ω/ft × 170 ft.
= 1.91 volts
%VRise = 1.91 volts ÷ 240 volts = 0.80%
The voltage rise from the IQ Combiner Box to the AC Disconnect is 0.80%

Voltage rise from the AC Disconnect to the MSP

VRise = (amps/inverter × number of inverters) × (resistance in Ω/ft.) × (2-way wire length in ft.)
= (1.21 amp × 19) × (0.000491 Ω/ft) × (5 ft. × 2)
= 23.0 amps × 0.000491 Ω/ft × 10 ft.
= 0.11 volts
%VRise = 0.11 volts ÷ 240 volts = 0.05%
The voltage rise from the AC Disconnect to the MSP is 0.05%

Total system voltage rise for all three wire sections

0.46% + 0.07% + 0.80% + 0.05% = 1.38%

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EMAIL ID: mraynor@harnett.k12.nc.us

DATE: 11/02/2022

SHEET NAME
SPECIFICATION & CALCS.

SHEET SIZE
ANSI B
11" X 17"

SHEET NUMBER
PV-4B

1

PHOTOVOLTAIC SYSTEM AC DISCONNECT
RATED AC OUTPUT CURRENT 23.0 AMPS
NOMINAL OPERATING AC VOLTAGE 240 VOLTS

LABEL LOCATION:
MAIN SERVICE PANEL/MAIN SERVICE DISCONNECT/AC DISCONNECT
PER CODE: NEC 690.13(B

2

WARNING
ELECTRICAL SHOCK HAZARD
TERMINALS ON BOTH LINE AND LOAD SIDES MAY BE ENERGIZED IN THE OPEN POSITION

LABEL LOCATION:
POINT OF INTERCONNECTION, MAIN SERVICE DISCONNECT, AC DISCONNECT, AC COMBINER, INVERTER
PER CODE: NEC 690.13(B)

3

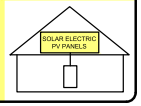
WARNING
INVERTER OUTPUT CONNECTION DO NOT RELOCATE THIS OVERCURRENT DEVICE

LABEL LOCATION:
PLACE THIS LABEL AT P.O.C. TO SERVICE DISTRIBUTION EQUIPMENT (I.E. MAIN PANEL (AND SUBPANEL IF APPLICABLE))
PER CODE: NEC705.12(D)(2)(b)

4

SOLAR PV SYSTEM EQUIPPED WITH RAPID SHUTDOWN

TURN RAPID SHUTDOWN SWITCH TO THE "OFF" POSITION TO SHUT DOWN PV SYSTEM AND REDUCE SHOCK HAZARD IN THE ARRAY



LABEL LOCATION:
MAIN SERVICE DISCONNECT IF MSD IS OUTSIDE PLACE IT THERE / IF MSD IS INSIDE PLACE ON THE AC DISCONNECT
PER CODE: NEC 690.56(C)(1)(a)

5

CAUTION: SOLAR CIRCUIT

LABEL LOCATION:
MARKINGS PLACED ON ALL INTERIOR AND EXTERIOR CONDUIT, RACEWAYS, ENCLOSURES, AND CABLE ASSEMBLIES AT LEAST EVERY 1O FT, AT TURNS AND ABOVE/BELOW PENETRATIONS AND ALL COMBINER/JUNCTION BOXES
PER CODE: IFC 606.11.1.4

6

CAUTION: SOLAR ELECTRIC SYSTEM CONNECTED

LABEL LOCATION:
POINT OF INTERCONNECTION & INVERTER
PER CODE: NEC 690.15 & 690.13(B)

7

WARNING - Electric Shock Hazard
No user serviceable parts inside
Contact authorized service provider for assistance

LABEL LOCATION:
INVERTER & JUNCTION BOXES (ROOF)
PER CODE: NEC 690.13 (G)(3) & 690.13 (G)(4)

8

WARNING: PHOTOVOLTAIC POWER SOURCE

LABEL LOCATION:
CONDUIT
PER CODE: 2017 NEC 690.31(G)(3)

9

CAUTION
DUAL POWER SOURCE
SECOND SOURCE US PHOTOVOLTAIC

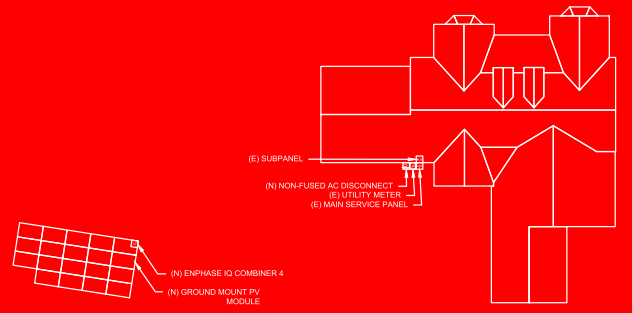
LABEL LOCATION:
MAIN SERVICE DISCONNECT/ AC DISCONNECT/ MAIN SERVICE PANEL/ REVENUE METER/ AC COMBINER
PER CODE: NEC 705.12(B)(3)

10

PHOTOVOLTAIC SYSTEM UTILITY DISCONNECT SWITCH

LABEL LOCATION:
AC DISCONNECT
2017 NEC 690.56(C)(3)

CAUTION
POWER TO THIS BUILDING IS SUPPLIED FROM THE FOLLOWING SOURCES WITH DISCONNECTS LOCATED AS SHOWN



PAUL CLAYTON CIR

ADHESIVE FASTENED SIGNS:

- ANSI Z535.4-2011 PRODUCT SAFETY SIGNS AND LABELS, PROVIDES GUIDELINES FOR SUITABLE FONT SIZES, WORDS, COLORS, SYMBOLS, AND LOCATION REQUIREMENTS FOR LABELS. NEC 110.21(B)(1)
- THE LABEL SHALL BE OF SUFFICIENT DURABILITY TO WITHSTAND THE ENVIRONMENT INVOLVED. NEC 110.21(B)(3).
- ADHESIVE FASTENED SIGNS MAY BE ACCEPTABLE IF PROPERLY ADHERED. VINYL SIGNS SHALL BE WEATHER RESISTANT.

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PHONE: 855-353-4899
ELECTRICAL LIC: U.21498

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PROJECT NAME & ADDRESS

RICKY RAYNOR
RESIDENCE
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COATS, NC 27521
PH NO. (919) 625-7661
EMAIL ID: mraynor@harnett.k12.nc.us

DATE: 11/02/2022

SHEET NAME
LABELS

SHEET SIZE
ANSI B
11" X 17"

SHEET NUMBER
PV-5

LGCY

FIELD DESIGN REQUEST FORM

JOB INFORMATION	
JOB NAME:	
ADDRESS:	

CHANGE REQUEST:

WHO AUTHORIZED THE CHANGE:	
DESCRIBE THE NEEDED CHANGE & WHY:	

NEW DESIGN LAYOUT:

DRAW THE MOUNTING PLANE SHOWING THE NEW MODULE LAYOUT:

INSTALLER NAME (PRINT)

I UNDERSTAND AND AGREE TO THE CHANGES MADE ABOVE

CUSTOMER NAME **CUSTOMER SIGNATURE** **DATE**

LGCY | SOLAR INSTALLATION SERVICES

JOB HAZARD ANALYSIS

CUSTOMER NAME/JOB ID:_____
CUSTOMER ADDRESS: _____
INSTALL DATE: _____-_____-_____ TIME: ____:____am/pm

HAZARD CATEGORY	HAZARD TYPE	HAZARD CONTROL MEASURES
LADDER SAFETY	• LOCATION • CONDITION • WORKING CLEARANCE	
FALL PROTECTION	• WORKING 6' OR HIGHER	
ELECTRICAL SAFETY	• ARCH FLASH • ELECTRIC • SHOCK/ELECTROCUTION	
WEATHER CONDITIONS	• HEAT/COLD TEMP • RAINY/ICY/WINDY	
PUBLIC SAFETY	• WORK/OBJECTS OVERHEAD • SLIPS/TRIPS/FALLS • ACCESS TO LIVE ELECTRICAL	

NEAREST EMERGENCY FACILITY	
CONTACT IMMEDIATELY IN EMERGENCY (911 AND/OR)	

GENERAL SITE DESCRIPTION/NOTES

CREW MEMBERS ON SITE FOR INSTALL

NAME	SIGNATURE
FMU/LMD-	

ELECTRICAL COMPLETION PHOTOS QR CODE

ROOFTOP INSTALLATION PHOTOS QR CODE

MPU COMPLETION PHOTOS QR CODE

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Charles R Sanderson Jr
ELECTRICAL LIC: U.21498

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DATE: 11/02/2022

SHEET NAME
JOB HAZARD ANALYSIS

SHEET SIZE
ANSI B
11" X 17"

SHEET NUMBER
PV-5A

DNA™ 120

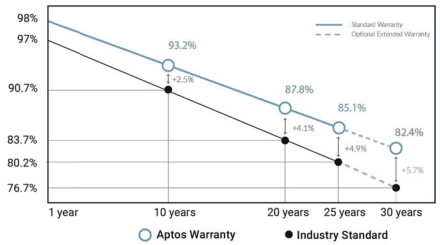
Solar for Innovators

Residential | Commercial

Designed & Engineered in Silicon Valley
440W | 435W | 430W

Our DNA Split Cell Series uses advanced selective emitter PERC technology with thin film layers to improve heat tolerance, increase photon capture, minimize resistive loss, and use 5% more of the available active area for optimal power performance. Our panels exceed IEC standards and come with an industry leading, 30-year warranty.

Linear Performance Warranty



Features

Advanced Technology
Patented DNA™ technology boosts power performance & module efficiency

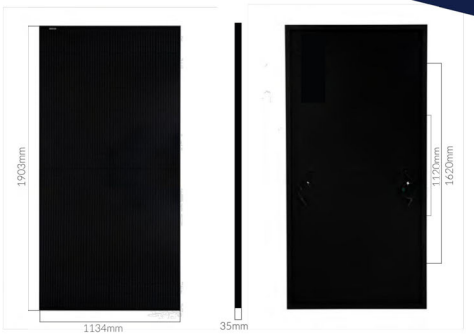
Maximum Panel Density
Advanced split cell technology with 9 ultra-thin busbars allows for less resistance and more photon capture

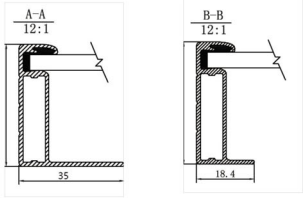
Durable Design
Robust product design is resilient in extreme weather. Up to 5400 Pa snow load and 5400 Pa wind load

A Safe Investment
Industry leading 30 year warranty

3140 De La Cruz Blvd., Ste 200
Santa Clara, CA 95054
www.aptossolar.com I info@aptossolar.com

DNA™ 120





Electrical Specifications

	DNA-120-MF10-440W	DNA-120-MF10-445W	DNA-120-MF10-440W
STCrated Output P_{mpp} (W)	440W	445W	450W
Module Efficiency	20.39%	20.62%	20.85%
Open Circuit Voltage V_{VOC} (V)	40.80	41.10	41.34
Short Circuit Current I_{SC} (A)	13.61	13.70	13.80
Rated Voltage V_{mmp} (V)	33.82	34.02	34.16
Rated Voltage I_{max} (A)	13.01	13.09	13.17

Standard Test Conditions for front-face of panel: 1000 W/m², 25°C, measurement uncertainty ≤3%

Temperature Coefficients

Temperature Coefficients P_{mmp}	-0.35%/°C
Temperature Coefficients I_{sc}	+0.06%/°C
Temperature Coefficients V_{OC}	-0.31%/°C
Nominal Operating Cell Temperature (NOCT)	45°C

Test Operating Conditions

Maximum Series Fuse	25A
Maximum System Voltage	1,500 VDC (UL&IEC)
Maximum Load Capacity (Per UL 1703)	5400 PA Snow Load / 5400 Pa Wind Loac
Fire Performance Class	Class C/Type 1

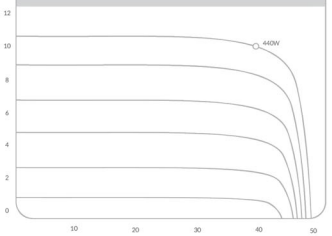
Packaging Configuration

Number of Modules per Pallet	31
Number of Pallets per 40ft. Container	24
Pallet Dimensions	2030 X 1220 X 1200
Pallet Weight (kg)	766
Container Weight (kg)	18,384

Mechanical Properties

Cell Type	Monocrystalline
Glass	3.2mm, anti-reflection coating, high transmission, low iron, tempered glass
Frame	Anodized Aluminum Alloy
Junction Box	IP68
Dimensions	1903 X 1134 X 35 mm
Output Cable	4mm2 (EU)12AWG,39.37in.(1200mm)
Weight	52.9lbs.(24kg)
Cable Length	1200mm
Encapsulant	POE

I-V Curve



Certifications

Intertek
UL61730-1, UL61730-2

Aptos Solar Technology reserves the right to make specification changes without notice

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EQUIPMENT SPECIFICATION

SHEET SIZE
ANSI B
11" X 17"

SHEET NUMBER
PV-6

ENPHASE.

DATA SHEET

IQ8 and IQ8+ Microinverters

Our newest IQ8 Microinverters are the industry's first microgrid-forming, software-defined microinverters with split-phase power conversion capability to convert DC power to AC power efficiently. The brain of the semiconductor-based microinverter is our proprietary application-specific integrated circuit (ASIC) which enables the microinverter to operate in grid-tied or off-grid modes. This chip is built in advanced 55nm technology with high speed digital logic and has super-fast response times to changing loads and grid events, alleviating constraints on battery sizing for home energy systems.

Part of the Enphase Energy System, IQ8 Series Microinverters integrate with the Enphase IQ Battery, Enphase IQ Gateway, and the Enphase App monitoring and analysis software.

Enphase 25 year limited warranty

IQ8 Series Microinverters redefine reliability standards with more than one million cumulative hours of power-on testing, enabling an industry-leading limited warranty of up to 25 years.

Connect PV modules quickly and easily to IQ8 Series Microinverters using the included Q-DCC-2 adapter cable with plug-n-play MC4 connectors.

UL CERTIFIED SAFETY

IQ8 Series Microinverters are UL Listed as PV Rapid Shut Down Equipment and conform with various regulations, when installed according to manufacturer's instructions.

Easy to install

- Lightweight and compact with plug-n-play connectors
- Power Line Communication (PLC) between components
- Faster installation with simple two-wire cabling

High productivity and reliability

- Produce power even when the grid is down*
- More than one million cumulative hours of testing
- Class II double-insulated enclosure
- Optimized for the latest high-powered PV modules

Microgrid-forming

- Complies with the latest advanced grid support**
- Remote automatic updates for the latest grid requirements
- Configurable to support a wide range of grid profiles
- Meets CA Rule 21 (UL 1741-SA) requirements

IQ8SP-DS-0002-01-EN-US-2021-03-17

* Only when installed with IQ System Controller 2, meets UL 1741.
** IQ8 and IQ8Plus supports split phase, 240V installations only.

IQ8 and IQ8+ Microinverters

INPUT DATA (DC)		IQ8-60-2-US	IQ8PLUS-72-2-US
Commonly used module pairings[1]	W	235 – 350	235 – 440
Module compatibility		60-cell/120 half-cell	60-cell/120 half-cell, 66-cell/132 half-cell and 72-cell/144 half-cell
MPPT voltage range	V	27 – 37	29 – 45
Operating range	V	25 – 48	25 – 58
Min/max start voltage	V	30 / 48	30 / 58
Max input DC voltage	V	50	60
Max DC current[2] [module Isc]	A	15	
Overvoltage class DC port		II	
DC port backfeed current	mA	0	
PV array configuration		1x1 Ungrounded array; No additional DC side protection required; AC side protection requires max 20A per branch circuit	
OUTPUT DATA (AC)		**IQ8-60-2-US**	**IQ8PLUS-72-2-US**
Peak output power	VA	245	300
Max continuous output power	VA	240	290
Nominal (L-L) voltage/range[3]	V	240 / 211 – 264	
Max continuous output current	A	1.0	1.21
Nominal frequency	Hz	60	
Extended frequency range	Hz	50 – 68	
AC short circuit fault current over 3 cycles	Arms	2	
Max units per 20 A (L-L) branch circuit[4]		16	13
Total harmonic distortion		<5%	
Overvoltage class AC port		III	
AC port backfeed current	mA	30	
Power factor setting		1.0	
Grid-tied power factor (adjustable)		0.85 leading – 0.85 lagging	
Peak efficiency	%	97.5	97.6
CEC weighted efficiency	%	97	97
Night-time power consumption	mW	60	
MECHANICAL DATA			
Ambient temperature range		-40°C to +60°C (-40°F to +140°F)	
Relative humidity range		4% to 100% (condensing)	
DC Connector type		MC4	
Dimensions (HxWxD)		212 mm (8.3") x 175 mm (6.9") x 30.2 mm (1.2")	
Weight		1.08 kg (2.38 lbs)	
Cooling		Natural convection – no fans	
Approved for wet locations		Yes	
Pollution degree		PD3	
Enclosure		Class II double-insulated, corrosion resistant polymeric enclosure	
Environ. category / UV exposure rating		NEMA Type 6 / outdoor	
COMPLIANCE			
Certifications		CA Rule 21 (UL 1741-SA), UL 62109-1, UL1741/IEEE1547, FCC Part 15 Class B, ICES-0003 Class B, CAN/CSA-C22.2 NO. 107.1-01 This product is UL Listed as PV Rapid Shut Down Equipment and conforms with NEC 2014, NEC 2017, and NEC 2020 section 690.12 and C22.1-2018 Rule 64-218 Rapid Shutdown of PV Systems, for AC and DC conductors, when installed according to manufacturer's instructions.	

(1) No enforced DC/AC ratio. See the compatibility calculator at https://link.enphase.com/module-compatibility
(2) Maximum continuous input DC current is 10.6A (3) Nominal voltage range can be extended beyond nominal if required by the utility. (4) Limits may vary. Refer to local requirements to define the number of microinverters per branch in your area.

IQ8SP-DS-0002-01-EN-US-2022-03-17

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SHEET NUMBER
PV-7

Data Sheet
Enphase Networking

Enphase IQ Combiner 4/4C

X-IQ-AM1-240-4
X-IQ-AM1-240-4C

X-IQ-AM1-240-4C


X-IQ-AM1-240-4

The **Enphase IQ Combiner 4/4C** with Enphase IQ Gateway and integrated LTE-M1 cell modem (included only with IQ Combiner 4C) consolidates interconnection equipment into a single enclosure and streamlines IQ microinverters and storage installations by providing a consistent, pre-wired solution for residential applications. It offers up to four 2-pole input circuits and Eaton BR series busbar assembly.

Smart

- Includes IQ Gateway for communication and control
- Includes Enphase Mobile Connect cellular modem (CELLMODEM-M1-06-SP-05), included only with IQ Combiner 4C
- Includes solar shield to match Enphase IQ Battery aesthetics and deflect heat
- Flexible networking supports Wi-Fi, Ethernet, or cellular
- Optional AC receptacle available for PLC bridge
- Provides production metering and consumption monitoring

Simple

- Centered mounting brackets support single stud mounting
- Supports bottom, back and side conduit entry
- Up to four 2-pole branch circuits for 240 VAC plug-in breakers (not included)
- 80A total PV or storage branch circuits

Reliable

- Durable NRTL-certified NEMA type 3R enclosure
- Five-year limited warranty
- Two years labor reimbursement program coverage included for both the IQ Combiner SKU's
- UL listed

LISTED

To learn more about Enphase offerings, visit **enphase.com**

ENPHASE

Enphase IQ Combiner 4/4C

MODEL NUMBER	
IQ Combiner 4 (X-IQ-AM1-240-4)	IQ Combiner 4 with Enphase IQ Gateway printed circuit board for integrated revenue grade PV production metering (ANSI C12.20 +/- 0.5%) and consumption monitoring (+/- 2.5%). Includes a silver solar shield to match the IQ Battery system and IQ System Controller 2 and to deflect heat.
IQ Combiner 4C (X-IQ-AM1-240-4C)	IQ Combiner 4C with Enphase IQ Gateway printed circuit board for integrated revenue grade PV production metering (ANSI C12.20 +/- 0.5%) and consumption monitoring (+/- 2.5%). Includes Enphase Mobile Connect cellular modem (CELLMODEM-M1-06-SP-05), a plug-and-play industrial-grade cell modem for systems up to 60 microinverters. (Available in the US, Canada, Mexico, Puerto Rico, and the US Virgin Islands, where there is adequate cellular service in the installation area.) Includes a silver solar shield to match the IQ Battery and IQ System Controller and to deflect heat.
ACCESSORIES AND REPLACEMENT PARTS	(not included, order separately)
Ensemble Communications Kit COMMS-CELLMODEM-M1-06 CELLMODEM-M1-06-SP-05 CELLMODEM-M1-06-AT-05	- Includes COMMS-KIT-01 and CELLMODEM-M1-06-SP-05 with 5-year Sprint data plan for Ensemble sites - 4G based LTE-M1 cellular modem with 5-year Sprint data plan - 4G based LTE-M1 cellular modem with 5-year AT&T data plan
Circuit Breakers BRK-10A-2-240V BRK-15A-2-240V BRK-20A-2P-240V BRK-15A-2P-240V-B BRK-20A-2P-240V-B	Supports Eaton BR210, BR215, BR220, BR230, BR240, BR250, and BR260 circuit breakers. Circuit breaker, 2 pole, 10A, Eaton BR210 Circuit breaker, 2 pole, 15A, Eaton BR215 Circuit breaker, 2 pole, 20A, Eaton BR220 Circuit breaker, 2 pole, 15A, Eaton BR215B with hold down kit support Circuit breaker, 2 pole, 20A, Eaton BR220B with hold down kit support
EPLC-01	Power line carrier (communication bridge pair), quantity - one pair
XA-SOLARSHIELD-ES	Replacement solar shield for IQ Combiner 4/4C
XA-PLUG-120-3	Accessory receptacle for Power Line Carrier in IQ Combiner 4/4C (required for EPLC-01)
XA-ENV-PCBA-3	Replacement IQ Gateway printed circuit board (PCB) for Combiner 4/4C
X-IQ-NA-HD-125A	Hold down kit for Eaton circuit breaker with screws.
ELECTRICAL SPECIFICATIONS	
Rating	Continuous duty
System voltage	120/240 VAC, 60 Hz
Eaton BR series busbar rating	125 A
Max. continuous current rating	65 A
Max. continuous current rating (input from PV/storage)	64 A
Max. fuse/circuit rating (output)	90 A
Branch circuits (solar and/or storage)	Up to four 2-pole Eaton BR series Distributed Generation (DG) breakers only (not included)
Max. total branch circuit breaker rating (input)	80A of distributed generation / 95A with IQ Gateway breaker included
Production metering CT	200 A solid core pre-installed and wired to IQ Gateway
Consumption monitoring CT (CT-200-SPLIT)	A pair of 200 A split core current transformers
MECHANICAL DATA	
Dimensions (WxHxD)	37.5 x 49.5 x 16.8 cm (14.75" x 19.5" x 6.63"). Height is 21.06" (53.5 cm) with mounting brackets.
Weight	7.5 kg (16.5 lbs)
Ambient temperature range	-40° C to +46° C (-40° to 115° F)
Cooling	Natural convection, plus heat shield
Enclosure environmental rating	Outdoor, NRTL-certified, NEMA type 3R, polycarbonate construction
Wire sizes	• 20 A to 50 A breaker inputs: 14 to 4 AWG copper conductors • 60 A breaker branch input: 4 to 1/0 AWG copper conductors • Main lug combined output: 10 to 2/0 AWG copper conductors • Neutral and ground: 14 to 1/0 copper conductors Always follow local code requirements for conductor sizing.
Altitude	To 2000 meters (6,560 feet)
INTERNET CONNECTION OPTIONS	
Integrated Wi-Fi	802.11b/g/n
Cellular	CELLMODEM-M1-06-SP-05, CELLMODEM-M1-06-AT-05 (4G based LTE-M1 cellular modem). Note that an Enphase Mobile Connect cellular modem is required for all Ensemble installations.
Ethernet	Optional, 802.3, Cat5E (or Cat 6) UTP Ethernet cable (not included)
COMPLIANCE	
Compliance, IQ Combiner	UL 1741, CAN/CSA C22.2 No. 107.1, 47 CFR, Part 15, Class B, ICES 003 Production metering: ANSI C12.20 accuracy class 0.5 (PV production) Consumption metering: accuracy class 2.5
Compliance, IQ Gateway	UL 60601-1/CANCSA 22.2 No. 61010-1

To learn more about Enphase offerings, visit **enphase.com**

ENPHASE

LGCY POWER
LGCY POWER
3333 DIGITAL DR#600, LEHI, UT 84043, UNITED STATES
PHONE: 855-353-4899
ELECTRICAL LIC: U.21498

REVISIONS		
DESCRIPTION	DATE	REV
REVISION	09/29/2022	A
REVISION	11/02/2022	B

Signature with Seal

PROJECT NAME & ADDRESS

RICKY RAYNOR
RESIDENCE
107 PAUL CLAYTON CIR
COATS, NC 27521
PH NO. (919) 625-7661
EMAIL ID: mraynor@harnett.k12.nc.us

DATE: 11/02/2022

SHEET NAME
EQUIPMENT SPECIFICATION

SHEET SIZE
ANSI B
11" X 17"

SHEET NUMBER
PV-8

Datasheet

360° Product Tour
Visit ironridge.com

Substructure

Top Caps

Connect vertical and cross pipes.

Bonded Rail Connectors

Attach and bond Rail Assembly to cross pipes.

Diagonal Braces

Optional Brace provides additional support.

Cross Pipe & Piers

Steel pipes or mechanical tubing for substructure.

Rail Assembly

XR100/XR1000 Rails

Curved rails increase spanning capabilities.

UFOs

Universal Fastening Objects bond modules to rails.

Stopper Sleeves

Snap onto the UFO to turn into a bonded end clamp.

CAMO

Bond modules to rails while staying completely hidden.

Resources

Design Assistant
Go from rough layout to fully engineered system. For free.
Go to ironridge.com/design

NABCEP Certified Training
Earn free continuing education credits, while learning more about our systems.
Go to ironridge.com/training

Datasheet

IRONRIDGE

Ground Mount System

Mount on all terrains, in no time.

The IronRidge Ground Mount System combines our XR1000 rails with locally-sourced steel pipes, or mechanical tubing, to create a cost-effective structure capable of handling any site or terrain challenge.

Installation is simple with only a few structural components and no drilling, welding, or heavy machinery required. In addition, the system works with a variety of foundation options, including concrete piers and driven piles.

Rugged Construction
Engineered steel and aluminum components ensure durability.

PE Certified
Pre-stamped engineering letters available in most states.

Simple Assembly
Just a few simple components and no heavy equipment.

Design Software
Online tool generates engineering values and bill of materials.

Flexible Architecture
Multiple foundation and array configuration options.

20 Year Warranty
Twice the protection offered by competitors.

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DATE: 11/02/2022

SHEET NAME
EQUIPMENT SPECIFICATION

SHEET SIZE
ANSI B
11" X 17"

SHEET NUMBER
PV-9

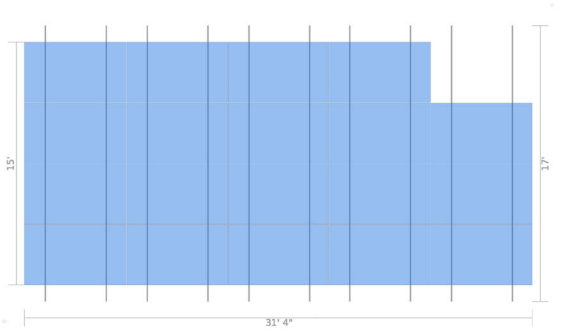
Project Details			
Name	Ricky Raynor	**Date**	11/02/2022
Location	107 Paul Clayton Circle, Coats, NC 27521	**ASCE code**	7.16
Total modules	19	**Wind speed**	110 mph
Module	Custom Panels: APTOS DNA-120-MF10-440W	**Snow load**	20 psf
Dimensions	Dimensions: 74.92" x 44.65" x 1.38" (1903.0mm x 1134.0mm x 35.0mm)	**Wind exposure**	C
Total watts	8,360 kW	**Piers**	12
		Concrete	2.48 yd³

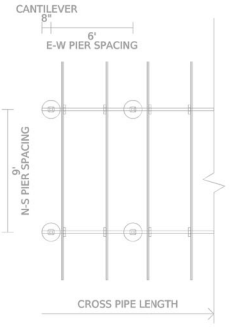
Substructure & Foundation			
Tilt	20°	**South facing grade**	0°
Pipe/tubing diameter	2"	**Soil class**	4
Foundation type	Concrete	**Hole diameter**	16"

Ricky Raynor (#1059603)
ground based

IRONRIDGE
28357 INDUSTRIAL BLVD., HAYWARD, CA 94545

Sub array #1					
Rows	4	**Columns**	5	**# Arrays**	1
Area	31' 4" (EW) x 15' 2" (NS)	**Rail type**	XR1000	**Diagonal bracing**	yes
E/W spacing	6'	**Rail cantilever**	3' 9"	**Pipe cantilever**	8"
Piers/array	12	**Total south piers**	6 (5' 1")	**Total north piers**	6 (8' 4")
Total cross pipes	2 (31' 4")	**Total pipe length**	143' 2"	**Cut back modules**	1
Shear	635 lbs	**Moment**	0 ft-lbs	**Uplift**	-1,227 lbs





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PHONE: 855-353-4899
ELECTRICAL LIC: U.21498

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Signature with Seal

PROJECT NAME & ADDRESS

RICKY RAYNOR
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COATS, NC 27521
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EMAIL ID: mraynor@harnett.k12.nc.us

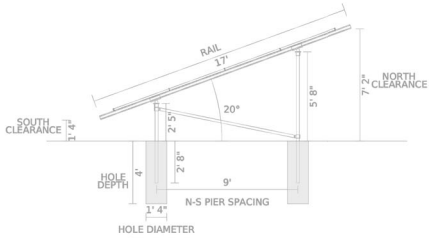
DATE: 11/02/2022

SHEET NAME
EQUIPMENT SPECIFICATION

SHEET SIZE
ANSI B
11" X 17"

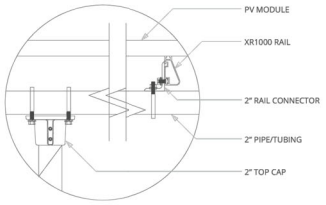
SHEET NUMBER
PV-10

IRONRIDGE
28357 INDUSTRIAL BLVD., HAYWARD, CA 94545

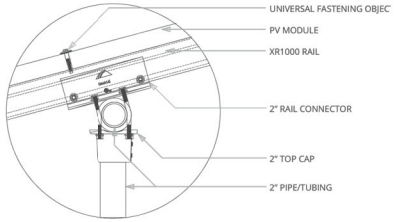


Pipe Fitting Detail

XR1000 Rail

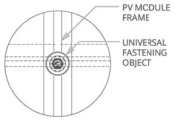


Front View

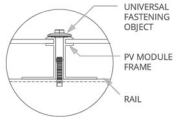


Side View

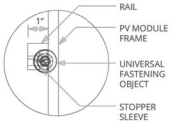
Clamp Detail



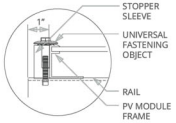
Mid Clamp, Plan



Mid Clamp, Front



End Clamp, Plan



End Clamp, Front

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ELECTRICAL LIC: U.21498

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107 PAUL CLAYTON CIR
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PH NO. (919) 625-7661
EMAIL ID: mraynor@harnett.k12.nc.us

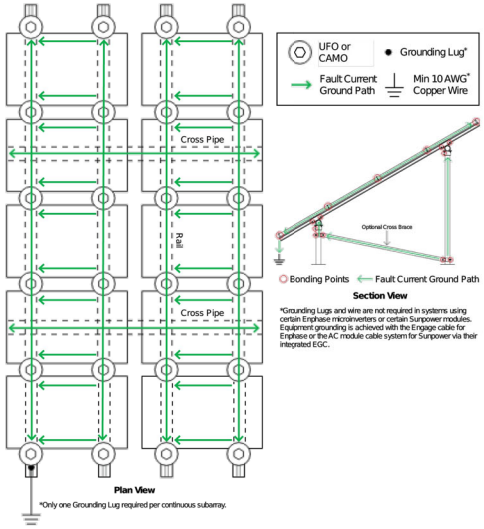
DATE: 11/02/2022

SHEET NAME
EQUIPMENT SPECIFICATION

SHEET SIZE
ANSI B
11" X 17"

SHEET NUMBER
PV-11

Grounding Diagram



Plan View

*Only one Grounding Lug required per continuous subarray.

Section View

*Grounding Lugs and wire are not required in systems using certain Enphase microinverters or certain Sunpower modules. Equipment grounding is achieved with the Engage cable for Enphase or the AC module cable system for Sunpower via their integrated EGC.

Ricky Raynor (#1059603)
ground based

IRONRIDGE
28357 INDUSTRIAL BLVD., HAYWARD, CA 94545

Bill of Materials

Part	Spares	Total Qty
Rails		
XR-1000-204A XR1000, Rail 204" (17 Feet) Clear	0	10
Clamps & Grounding		
UFO-CL-01-A1 Universal Module Clamp, Clear	0	48
UFO-STP-35MM-M1 Stopper Sleeve, 35MM, Mill	0	20
XR-LUG-03-A1 Grounding Lug, Low Profile	0	1
Substructure		
70-0200-SGA SGA Top Cap at 2"	0	12
GM-BSC-002 Ground Mount Bonded Rail Connector - 2"	0	20
70-0205-CBR SGA 2"Brace Assembly (5-Panel) (bulk)	0	6

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DATE: 11/02/2022

SHEET NAME
EQUIPMENT SPECIFICATION

SHEET SIZE
ANSI B
11" X 17"

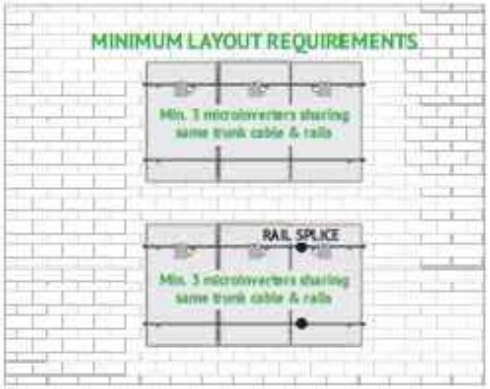
SHEET NUMBER
PV-12

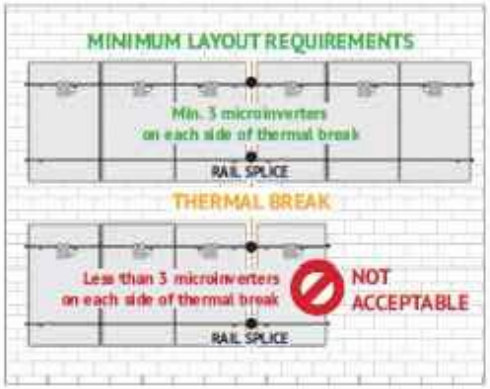
SM SOLAR MOUNT

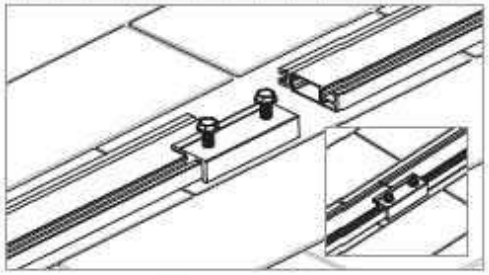
ELECTRICAL GROUNDING W/ ENPHASE MICROINVERTER FOR SPLICE & THERMAL BREAK

INSTALLATION GUIDE | J PAGE

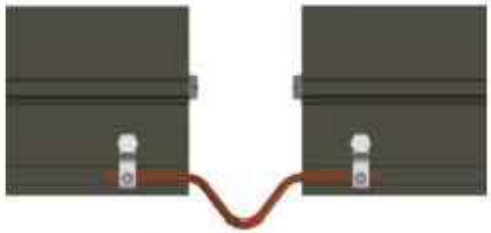
CONTINUOUS RAIL & ELECTRICAL BONDING SPLICE	EXPANSION JOINT W/GROUNDING LUGS & COPPER JUMPER	EXPANSION JOINT W/O ELECTRICAL BONDING CONNECTION
Enphase Microinverter (MI) Requirements (Model No. M215 & M250)	Enphase Microinverter (MI) Requirements (Model No. M215 & M250)	Enphase Microinverter (MI) Requirements (Model No. M215 & M250)
3 Microinverters sharing same trunk cable & rails	3 or more Microinverters sharing same trunk cable & rails	Min. 3 Microinverters on each side of thermal break







ELECTRICAL BONDING SPLICE



EXPANSION JOINT USED AS THERMAL BREAK W/ GROUNDING LUGS & COPPER JUMPER

EXPANSION JOINT USED AS THERMAL BREAK W/O ELECTRICAL BONDING CONNECTION

NOTE: THE ABOVE IMAGES ARE SAMPLE CONFIGURATIONS TO ILLUSTRATE THE REQUIREMENTS FOR SM SYSTEM GROUNDING THROUGH ENPHASE MICROINVERTERS DESCRIBED ON PAGE 1

LGCY POWER

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3333 DIGITAL DR#600, LEHI,
UT 84043, UNITED STATES
PHONE: 855-353-4899

ELECTRICAL LIC: U.21498

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RICKY RAYNOR
RESIDENCE
107 PAUL CLAYTON CIR
COATS, NC 27521
PH NO. (919) 625-7661
EMAIL ID: mraynor@harnett.k12.nc.us

DATE: 11/02/2022

SHEET NAME
EQUIPMENT SPECIFICATION

SHEET SIZE
ANSI B
11" X 17"

SHEET NUMBER
PV-13

March 28, 2022

Unirac
1411 Broadway Blvd. NE
Albuquerque, NM 87102

Attn.: Unirac - Engineering Department

Re: Engineering Certification for the Unirac U-Builder 2.0 SOLARMOUNT Flush Rail

PZSE, Inc. - Structural Engineers has reviewed the Unirac SOLARMOUNT rails, proprietary mounting system constructed from modular parts which is intended for rooftop installation of solar photovoltaic (PV) panels; and has reviewed the U-builder Online tool. This U-Builder software includes analysis for the SOLARMOUNT LIGHT rail, SOLARMOUNT STANDARD rail, and SOLARMOUNT HEAVY DUTY rail with Standard and Pro Series hardware. All information, data and analysis contained within are based on, and comply with the following codes and typical specifications:

1. Minimum Design Loads for Buildings and other Structures, ASCE/SEI 7-05 and ASCE/SEI 7-10
2. 2006-2015 International Building Code, by International Code Council, Inc.
3. 2006-2015 International Residential Code, by International Code Council, Inc.
4. AC428, Acceptance Criteria for Modular Framing Systems Used to Support Photovoltaic (PV) Panels, November 1, 2012 by ICC-ES.
5. 2015 Aluminum Design Manual, by The Aluminum Association, 2015

Following are typical specifications to meet the above code requirements:

Design Criteria: Ground Snow Load = 0 - 100 (psf)
Basic Wind Speed = 85 - 190 (mph)
Roof Mean Height = 0 - 60 (ft)
Roof Pitch = 0 - 45 (degrees)
Exposure Category = B, C & D

Attachment Spacing: Per U-builder Engineering report.

Cantilever: Maximum cantilever length is L/3, where "L" is the span noted in the U-Builder online tool.

Clearance: 2" to 10" clear from top of roof to top of PV panel.

Tolerance(s): 1.0" tolerance for any specified dimension in this report is allowed for installation.

Installation Orientation: See SOLARMOUNT Rail Flush Installation Guide.
Landscape - PV Panel long dimension is parallel to ridge/eave line of roof and the PV panel is mounted on the long side.
Portrait - PV Panel short dimension is parallel to ridge/eave line of roof and the PV panel is mounted on the short side.

1478 Stone Point Drive, Suite 190, Roseville, CA 95661
T 916.961.3960 F 916.961.3965 W www.pzse.com
Experience | Integrity | Empowerment

Components and Cladding Roof Zones:
The Components and Cladding Roof Zones shall be determined based on ASCE 7-05 and ASCE 7-10 Component and Cladding design.

Notes:
1) U-builder Online tool analysis is only for Unirac SM SOLARMOUNT Rail Flush systems only and do not include roof capacity check.
2) Risk Category II per ASCE 7-10.
3) Topographic factor, kzt is 1.0.
4) Average parapet height is 0.0 ft.
5) Wind speeds are LRFD values.
6) Attachment spacing(s) apply to a seismic design category E or less.

Design Responsibility:
The U-Builder design software is intended to be used under the responsible charge of a registered design professional where required by the authority having jurisdiction. In all cases, this U-builder software should be used under the direction of a design professional with sufficient structural engineering knowledge and experience to be able to:

- Evaluate whether the U-Builder Software is applicable to the project, and
- Understand and determine the appropriate values for all input parameters of the U-Builder software.

This letter certifies that the Unirac SM SOLARMOUNT Rails Flush, when installed according to the U-Builder engineering report and the manufacture specifications, is in compliance with the above codes and loading criteria.

This certification excludes evaluation of the following components:
1) The structure to support the loads imposed on the building by the array; including, but not limited to: strength and deflection of structural framing members, fastening and/or strength of roofing materials, and/or the effects of snow accumulation on the structure.
2) The attachment of the SM SOLARMOUNT Rails to the existing structure.
3) The capacity of the solar module frame to resist the loads.

This requires additional knowledge of the building and is outside the scope of the certification of this racking system.

If you have any questions on the above, do not hesitate to call.

Prepared by:
PZSE, Inc. – Structural Engineers
Roseville, CA

DIGITALLY SIGNED
NORTH CAROLINA PROFESSIONAL SEAL 41973 EXP. 12/31/2022 ENGINEER PAUL K. ZACHER
03/28/2022

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ELECTRICAL LIC: U.21498

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DATE: 11/02/2022

SHEET NAME
EQUIPMENT SPECIFICATION

SHEET SIZE
ANSI B
11" X 17"

SHEET NUMBER
PV-14